

4.15

Properties of Logarithmic Functions and Graphs of Logarithms

Name _____ Date _____ Period _____

Assuming x and y are positive, use properties of logarithms to write the expression as a sum or difference of logarithms or multiples of logarithms.

1. $\ln 4x$

2. $\ln 27y$

3. $\log \frac{5}{y}$

4. $\log \frac{6}{x}$

5. $\log y^4$

6. $\log_3 x^{-2}$

7. $\log x^2 y^3$

8. $\log x^3 y$

9. $\ln \frac{x^3}{y^2}$

10. $\log 10000x^3$

11. $\log \sqrt[4]{\frac{y}{x}}$

12. $\ln \frac{\sqrt[3]{y}}{\sqrt[3]{x}}$

Assuming x , y and z are positive, use properties of logarithms to write the expression as a single logarithm.

13. $\log x + \log z$

14. $\log y + \log 7$

15. $\ln x - \ln 5$

16. $\ln y - \ln x$

17. $\frac{1}{2} \ln y$

18. $\frac{1}{4} \ln z$

19. $3 \ln z + 2 \ln x$

20. $2 \log x - \log y$

21. $3 \log (xy) - 2 \log (yz)$

22. $2 \ln (x^2 y) + 3 \ln (yz^3)$

Rewrite using the change-of-base formula and use your calculator to evaluate the logarithm. Round to the nearest ten thousandths.

23. $\log_3 5$

24. $\log_4 18$

25. $\log_6 159$

26. $\log_{13} 236$

27. $\log_{0.5} 15$

28. $\log_{0.2} 34$

Write the expression using only natural logarithms.

29. $\log_4 x$

30. $\log_8 x$

31. $\log_3 (x + y)$

32. $\log_5 (a - b)$

Write the expression using only common logarithms.

33. $\log_3 x$

34. $\log_5 x$

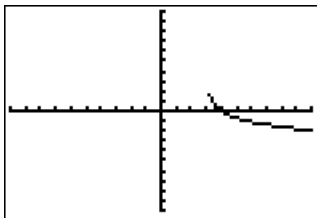
35. $\log_{1/3} (x + y)$

36. $\log_{1/2} (x - y)$

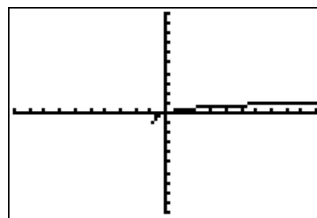
Match the function with its graph. Remember the line goes on forever, but the calculator can't show it once it gets too close to the asymptote.

37. $f(x) = \log(1-x)$

a)



b)

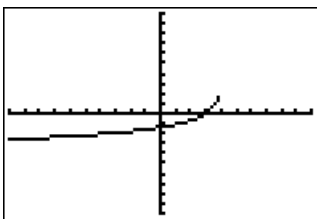


38. $f(x) = \log(x+1)$

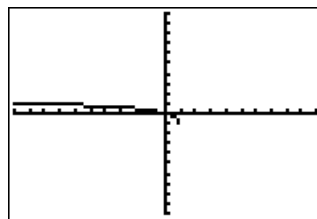
39. $f(x) = -\ln(x-3)$

40. $f(x) = -\ln(4-x)$

c)

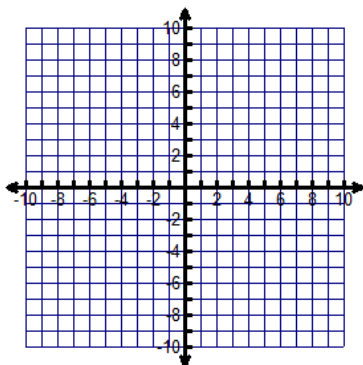


d)

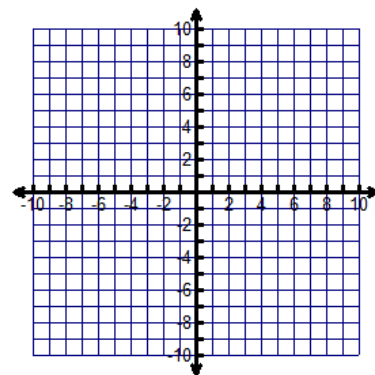


Describe the transformations that were used to change either the graph of $y = \log x$, or $y = \ln x$ into the given functions. Graph the transformation without a calculator. Write the domain.

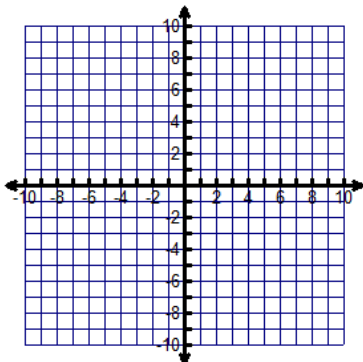
41. $f(x) = \ln(x+3)$



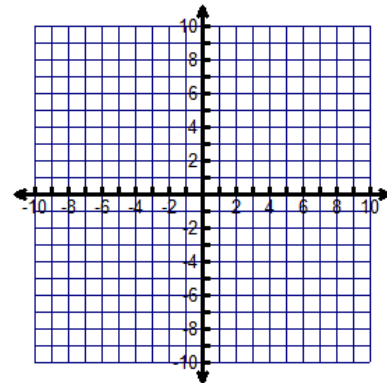
42. $f(x) = \ln(-x)+3$



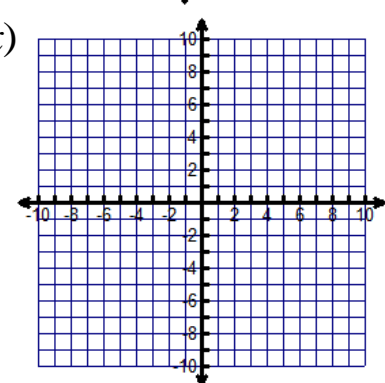
43. $f(x) = \ln(2-x)$



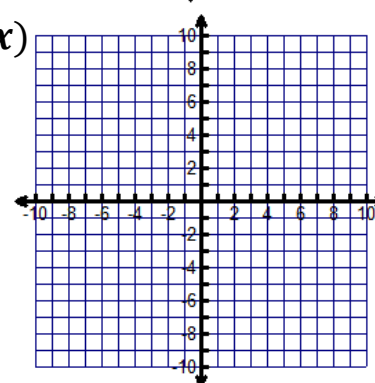
44. $f(x) = -1 + \log(x)$



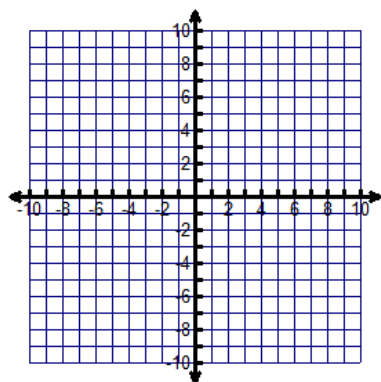
45. $f(x) = -2\log(-x)$



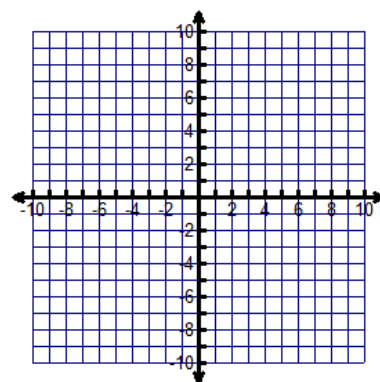
46. $f(x) = -\log_3(-x)$



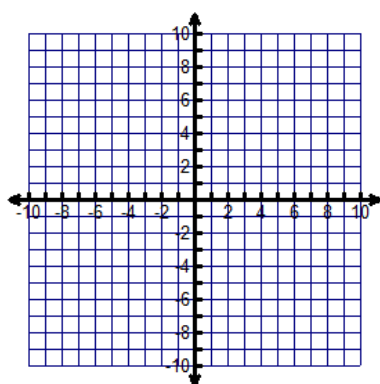
47. $f(x) = -\log_2(x - 3)$



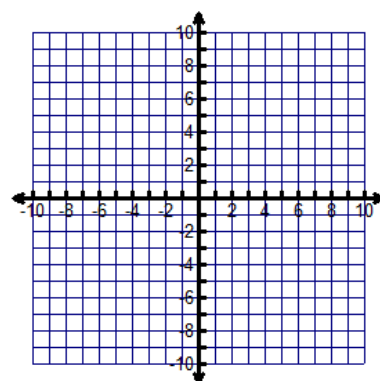
48. $f(x) = 3 + \log_2(x + 2)$



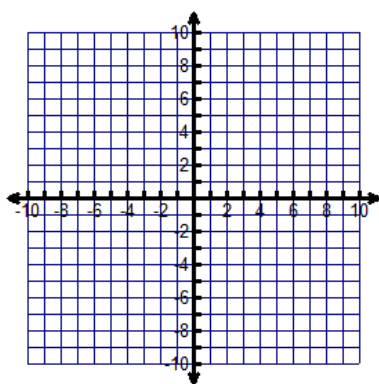
49. $f(x) = \log_3(2x + 5)$



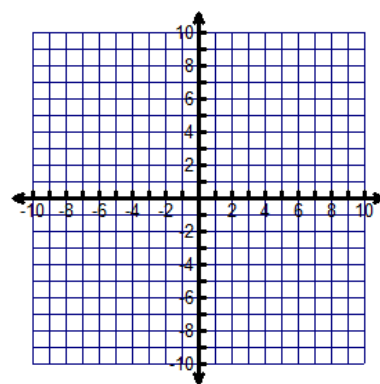
50. $f(x) = \log_5(3 - 2x) - 4$



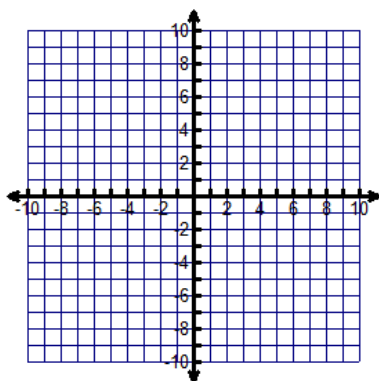
51. $f(x) = \log_3(x - 4) - 2$



52. $f(x) = -3\log_4(-2x) + 5$



53. $f(x) = 3\log_4(2 - 3x) - 5$



54. $f(x) = \log_2(-3x)$

